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LIFE ORIGINATED WHERE TIDES EBB AND FLOW

In a shallow brackish water, warmed by the sun to temperatures such as occur in tidepools of today, the forerunners of living things as we knew them must have originated, Dr. D. T. MacDougal, director of the department of botanical research of the Carnegie Institution of Washington, told the Royal Canadian Institute at Toronto in describing what the scientist knows of the beginnings of life.

"The first form of life on this globe must have been minute masses of primordial jellies," said Dr. MacDougal. "The beginnings of life could not have been in the monotonous immensity of the seas, which are really a uniformly salt solution with but minute variations. Where the sea met the land,however, many new combinations were possible. There was no soil on the land, for this is a product of plants and animals. The landscape was of bare rocks, sand and water. Rapid alternations of sunshine and clouds with abundant rains would have characterized such a time, and volcanoes may have belched out earth encircling volumes of ashes and gases some of which would come down with the rains. Hydrocarbons, ammonia, hydrogen phosphide, and other necessary compounds might thus have been brought together accidentally but frequently with the result that there may have been formed countless masses of matter which might have become the basis of changes upon which life might be developed.

"In any case the compounds formed, which might have been jellies, did not fall into the way of beginning life as we know it until it became the seat of changes by which organic compounds were formed. For this to have happened, the colloidal or jelly condition must be assumed. This formation of additional masses of jelly and retaining them would go on until a certain size was reached, when fission or division would ensue as a drop of water too large divides into two smaller ones. This would have been the beginnings of growth and reproduction which are today the fundamental phases of biology."

The basis of all life from moss to men is protoplasm, a jelly-like substance, said Dr. MacDougal. The way in which this delicate jelly acts is universal, but its make-up is infinitely complex, although all protoplasm is made up of four general classes of substances, albumins, gums or mucilages, lipoids or fatty substances, and soaps.

"Somewhere in the ever more complex web of life the sun-traps or screens of coloring matter, which absorb and use the energy of certain rays of light in running the protoplasmic mill of plant life were made," said Dr. MacDougal. "These may have been of various colors, absorbing different patterns of the spectrum. The type of screen which has survived is that of leaf-green or chlorophyll. The chlorophyll

of the plant cell absorbs radiations of certain wave-lengths and the derived energy is ultimately used in the formation of sugars, and other chemical combinations. Transformations quickly follow, which result in nitrogenous substances. These products of the leaf mill are absolutely fundamental to the existence of the living world.

"The formation of coal beds was the final result of this photosynthesis of bygone ages, and when the accumulated remains of millions of years of the activity of vegetation is used the race will face the sternest necessity which it has yet encountered. We may discover other coal deposits, find new subterranean lakes of oil, get gasoline from shales, make use of corn cobs and seaweed, convert the power of our streams and harness the tides, but these are but petty economies deferring the day when, all of these proving inadequate, the major activities of the race, civilization in its present movement, and indeed the actual existence of man, will depend upon direct use of the energy of sunlight."

THANKSGIVING BIRD CROWDED FROM COUNTRY

Thanksgiving turkeys are becoming scarcer according to officials of the U. S. Department of Agriculture. This native American fowl, which Benjamin Franklin proposed should be made the national bird instead of the predatory eagle, is being crowded out as the population increases, census figures show.

While the number of potential turkey eaters in this country has increased thirty millions in the past twenty years, the number of turkeys raised on farms in this country has declined from 6,594, 695 in 1900 to 3,627,028 in 1920 with the decrease continuing steadily during the last two years. Wild turkeys once so plentiful have almost disappeared.

The chief cause of this decrease, officials state, is that the area of range suitable for turkey raising is reduced as the increase in population makes farming more intensive. Every year farmers are giving up attempts to raise this festive fowl in order to keep from severing neighborly relations, for turkeys are communists, recognizing no private property, and often getting into grain fields of adjacent farms.

Sometimes the wild fowl will invade the barnyard and sometimes the domesticated bird will become a renegade and take up life with his wild brothers. All domestic varieties of turkeys, however, are descended from wild turkeys. These wild birds ranged North America from New England to Arizona and Florida and are still found in the more unsettled sections of their former range, particularly in the mountainous parts of Texas, New Mexico, and Arizona, and in large swamps and hummocks in the Gulf states.

The chief distinguishing characteristic between common wild turkeys in the eastern part of the United States and the farm raised fowls is that the latter shows the white feather while the game turkey is of a brilliant copperish bronze.

Some of the wild turkeys now being raised on game preserves in the east, show white feathers on wings and tails. But these fowls get this coloring from mixture with the Mexican wild turkey whose tail tips are white, and not from mixture with tame turkeys, breeders claim. It was from the Mexican turkey, however, that the domesticated breeds originated.

Another species of wild turkey, found in Central America and known as the Hon-

duras turkey, is quite distinct from the North American species. It has beautiful plumage of bright green shaded with blue, red, bronze, and black. It is somewhat smaller than the North American wild turkey and has never been domesticated to any great extent.

The turkey was domesticated by the Mexicans long before the Spaniards conquered Mexico in 1518. Those ancient Indians did not have horses, cattle, or other domestic animals to help build up their civilization, but they did eat turkey.

The turkey did not come from Turkey although when it was named people believed that it did. Like many true American animals and plants, the turkey emigrated to the old world early and Europeans became so accustomed to them that they believed they had always had them.

READING REFERENCE- Graybill, H.W. Artificial incubation and brooding of turkeys. New Jersey Agriculture Experiment Station Bulletin 374. 1921. Lamon, Harry Miles and Slocum, R.R. Turkey raising. N.Y. Orange Judd Pub. Co., 1922.

(A Chat on Science)

TO EXCHANGE: A CHEMICAL FOR A COLONY

By Edwin E. Slosson.

The German chemists are trying to win back the colonies that the German Kaiser lost. They are offering to trade a new coal-tar drug for the African territory which Germany held before 1914, but which fell to the victors of the Great War. This territory amounts to a million square miles, or one-third the area of the United States, and has been divided up by mutual agreement between Great Britain, France, Belgium and Portugal. It comprises some of the richest and most fertile land on the globe but it rests under a curse, the sleeping sickness.

This mysterious malady, that has laid waste a large part of the Dark Continent, is now known to be due to a minute parasite that lives in the blood of man and beast, and is called a trypanosome. When you look at one through a microscope you would not think that so little a creature could have so long a name or do so much harm. He looks like a smashed mosquito wiggler or a stickless kite. It propels itself along by sculling with its whip-like tail. The tsetse fly gets its living by sucking the blood of wild animals, cattle and human beings, and in so doing peddles about the microbe from sick to well. There are various sorts of trypanosomes and blood-sucking flies, each having its own habits and routes, but anyhow the infected individual suffers at first from fever and gradually sinks into an insensibility, from which the sleeper rarely wakes. This sort of sleeping sickness is peculiar to Africa and has nothing in common with the disease that has recently appeared in America except the name and somnolent symptom.

In the latter part of the last century when Europeans invaded the interior of Africa they found this micro-organism the most dangerous of the wild animals to be combated. Lions and elephants could be killed but the tsetse fly was too small to be shot and the trypanosome was too small to be seen. How to destroy the parasite without harming the host was the question.

The first sign of a solution of the problem came in 1904 when the German phy-

sician Ehrlich and his Japanese assistant, Shiga, discovered an aniline dye which injected into the blood of a person seized with sleeping sickness would kill the parasite. This dye was named "trypan red". Two years latter Mesnil and Nicolle of the Pasteur Institute of Paris found that several similar dyes made by the Bayer Dye Works were also serviceable. These dye-drugs were all derivatives of naphthalene, familiar to us all since little white balls of it drop from our clothes when we shake them out in the fall.

But none of the known dyes were sufficiently active so that they were certain to clean out the pests from the body of the patient. The Bayer company has quietly continued its search for something more powerful and equally innocuous and has at last, after 204 compounds had been made and found unsatisfactory, got one that cures. It is not a dye but a white powder, soluble in water. It was tried successfully on mice, rats, guinea-pigs, rabbits, dogs and horses and finally upon men. An English patient who had suffered from sleeping sickness for a year and on whom all the customary remedies had been tried in vain, was cured by four doses amounting altogether to an eighth of an ounce. Better still it is found that a single dose will make a person immune to the disease for a long period even if infected by the fly. It is also said that the new medicine or some of its relatives will cure malaria and other tropical fevers.

Whether Bayer 205 is a plain naphthalene derivative like the earlier efforts of the firm or whether it contains arsenic like "606", which is used to destroy a similar blood parasite, is not known to the outside world for the composition is kept secret. Small samples of the drug have been furnished for experimentation to Belgian, British and American physicians but under pledge of professional secrecy.

At a recent meeting in Hamburg of the German Association of Tropical Medicine one of the speakers said:

"Bayer 205 is the key to tropical Africa, and consequently the key to all the colonies. The German government must, therefore, be required to safeguard this discovery for Germany. Its value is such that any privilege of a share in it granted to other nations must be made conditional upon the restoration to Germany of her colonial empire."

It is indeed the irony of fate that the Germans should have found the means of making their colonies colonizable only after they had lost them and that their discovery must go to benefit those who took their African territories from them. But this suggestion of buying back a million square miles for a single chemical symbol can hardly be taken seriously. The chemists of other countries are already hot on their trail and with what clues they have will doubtless eventually find out the composition of the mysterious medicine. But whether Germany makes anything out of it or not, it may turn out that her scientists by this discovery will bring as much benefit to Africa as her soldiers did damage in Europe.

READING REFERENCE- Carpenter, Geoffrey D.H. A naturalist on Lake Victoria, with an account of sleeping sickness and tsetse fly. London, T.F. Unwin, 1920.
Newstead, R. A new tsetse fly from South Camerons. Annals of Tropical Medicine, 16:51-54. March, 1922.

FUMIGATING GAS WAVES ITS OWN RED LANTERN

A new fumigating gas which saves human lives by giving warning of its presence, has been developed by the U. S. Public Health Service in cooperation with the Chemical Warfare Service of the War Department, it has been announced by a board appointed to investigate ship fumigation. It will be used in ridding ships, cars and houses of rats, bedbugs, lice and other insects.

Hydrocyanic acid gas, the fumigant now used, has occasionally cost human lives because of lack of odor, although by killing disease-carrying vermin it has prevented serious epidemics from sweeping over the country.

The weeping is done by the potential victim, not by his relatives, when the new gas is used, the experts explained. Cyanogen chloride, a very active tear gas and a by-product of war work, is mixed with the hydrocyanic acid gas to form the new combination for fumigating use. The new poison is easily detected as doses too weak to deliver a knock-out produce severe weeping. It is harmless to foods, tobacco, fabrics, leather, and has no corrosive action on metals that may be on board. The gas does its work quickly and then dissipates rapidly. It costs but little more than the fumigants which are more dangerous to handle.

Hydrocyanic acid gas and sulphur dioxide are the gases which have been used largely in ship fumigation, the board's report explained. Sulphur dioxide, although it gives warning of its presence in time to allow the escape of any person within the quarters where it is used, is costly, harmful to clothing and foodstuffs and requires from 5 to 12 hours exposure. Hydrocyanic acid gas is cheaper and more poisonous than the sulphur dioxide and does not affect food, clothing, or other articles. But it is odorless and nonirritating and leads to fatalities due from failure to detect its presence in time.

READING REFERENCE- Creel, Richard H. Hydrocyanic acid gas. Washington, D.C. Govt. printing office. From Public Health Reports v. 30 no. 49. Dec. 3, 1915.
Compere, G. Origin of fumigation with hydrocyanic acid gas in California. California Agric. Dept. Bulletin. v. 11:438-42. May, 1922.

GLUCOSE RECOMMENDED AS AUTO RADIATOR ANTI-FREEZE CHEMICAL

Glucose is recommended as a preventive of automobile radiator freezing by Dr. Charles H. LaWall, department of Theoretical Pharmacy, Philadelphia College of Pharmacy and Science.

"For four winters past I have successfully employed commercial glucose with unquestioned efficacy and with no detrimental results whatever," explained Dr. LaWall.

He believes that glucose is superior to anti-freezing mixtures containing denatured or wood alcohol, glycerine, or some chemical salt such as calcium chloride. The ordinary confectioners' white glucose is preferred, although on one occasion he used the glucose sold for table use.

The amount necessary is between 15 and 20 per cent. or about a pint and a half of glucose to a gallon of water. The glucose may be mixed with enough warm water to completely dissolve it and then added to the remainder of the water in the radiator. No further addition or attention is necessary except to replace the water lost by

evaporation. When warm weather arrives the radiator should be emptied, rinsed out and filled up with plain water.

"In addition to using the mixture practically for four years with satisfactory results I also performed some experiments to determine the congealing point of such a mixture," said Dr. LaWall. "I found that it begins to get slushy at about 10 degrees above zero Fahrenheit, but that it does not actually freeze and harden even at 6 degrees below zero Fahrenheit."

"Glucose does not corrode nor affect metals; in fact, it prevents such action by virtue of its chemical reducing properties. It seems to have no effect upon rubber in the dilution used; at least, I have never had to replace my rubber hose connections. There are no objections to glucose at all that I have found and its inexpensiveness and the freedom from the annoyance of constantly having to replace a volatile solvent such as alcohol, are unquestioned advantages."

READING REFERENCE- Williams, R. H. Manufacture of starch, glucose and by-products. Canadian Chemistry and Metallurgy 5:195-6 July, 1921.

NEWS OF THE STARS

Helium Hunting in the Milky Way

By Isabel M. Lewis,
of the U.S. Naval Observatory.

Helium, our wonderful non-inflammable balloon gas, does more than lift airships without danger from explosion.

Much is being learned of the size, structure, and form of the universe by a study of the stars containing incandescent helium.

Stars of the helium type give light which when broken up by the spectroscope shows prominently the bright yellow lines of helium; indicating that this gas is present conspicuously in their atmosphere. They are excessively hot and massive and bluish-white in color and they occur in abundance - often as double, triple or multiple stars enmeshed in nebulosity, in the constellation of Orion. Hence their name of Orion stars.

It was found some time ago that comparatively near us in space, that is, so near to our solar system that light travelling 186,000 miles per second would only take a few hundred years to reach it, there exists a local cluster or group of these helium stars in the constellation of Orion. In fact, our sun is a star in the Milky Way and within this extensive group. It is about fifty light years to the north of the central plane of that great galaxy.

Enormous dark tracts of nebulosity in that thickly star-strewn space, located in the constellations of Centaurus and Scorpio and shutting off light from stars beyond, lie between 650,000 and 975,000 light years from the solar system. This is about the greatest distance that has been found for any type of celestial object and shows how enormous is the extent of the Milky Way along its greatest axis.

Because all the helium stars in the Orion group are well within the range of vision of the naked eye or at most no fainter than stars of the seventh magnitude

which lie just beyond the naked-eye vision, it was assumed that there were few, if any, fainter helium stars lying beyond this group.

Recent investigations made at the Harvard College Observatory and based upon data furnished by the new Henry Draper Catalogue, however, reveal that there are many faint helium stars beyond and independent of this local group. These fainter stars are confined closely to the vicinity of the Milky Way, lying within a belt only ten degrees wide on either side of it. Some of these stars must be at distances of thousands of light-years from the earth. It has been found also that the distribution of helium stars is not uniform along the Milky Way. In some regions they are grouped more densely than in others and the southern sky is particularly rich in stars of this class.

Just as the Columbuses and Magellans by means of their ships made voyages into the unknown regions of our earth and brought back new knowledge of the size and shape of the world on which we live, so these explorers of the skies with their spectroscopes seeking out the helium stars are adding to our knowledge of the star-lit universe of which our planet is a part.

READING REFERENCE- Abbot, Charles Greeley. The discovery of helium and what came of it. (In Smithsonian institution Annual report. 1918. p. 121-126.)
Taylor, L. W. Width of certain lines of the spectrum of helium. Astrophysical Journal 56:16-28. July, 1922.

AIRPLANE CAMERA SURVEYS MISSISSIPPI DELTA

For the first time the great delta of the Father of Waters, the Mississippi, has just been surveyed with true accuracy, it has been learned from the U. S. Coast and Geodetic Survey. From the air, by using cameras, that great fan-shaped marshy region stretching 600 miles into the Gulf of Mexico was charted, and important shifts of land and water were discovered.

Formerly it was necessary to survey it from boats, using tall signals and special ladders and tripods, on account of the prevalence of marshes and tall vegetation. Much of it is inaccessible on foot. For these reasons the topography of this area has always been largely a matter of guesswork on the part of surveyors and engineers. A seaplane, camera and men were furnished for the survey by the Navy, and pictures were taken of the delta from a height of 8,000 feet. Over a thousand photographs were subsequently formed into a mosaic or composite picture.

Many totally unknown lakes and ponds were discovered by the aviators. Old stream-beds and changes due to over-flowing banks could be traced. New sub-deltas were found that had formed since the last survey. Some places existing on the last chart have either ceased to exist or have altered completely in form.

The most important of these changes is in the vicinity of the South Pass, the main entrance to the river. Former surveys showed the west bank of this Pass as a marshy area extending out into the Gulf for a distance of over four miles. Now, according to this recent photographic mapping, it is merely a narrow strip, so narrow that it is giving the engineers considerable concern as a new "crevasse" may break through at any time, completely altering the mouth of the river.

Owing to the many forces constantly at work on the Delta, changing the contour

of the coastline, producing entirely new areas and completely wiping out others, it has been necessary to survey it frequently. With aerial photography, this can be accomplished in much less time and with more accuracy than by the old methods. As it is a region of practically no difference in height such as would cause errors in scale, it is admirably suited to this method of surveying.

NEGRO BLOOD BECOMING WHITER

The blood of the American negro shows a characteristic approaching that of the white race, according to Dr. Julian H. Lewis and D. S. Henderson of Sprague Memorial Institution, Chicago, who believe that this is caused by the admixture of the negro with the white race.

Dr. Lewis and Mr. Henderson reached their conclusion after a study of the blood of 270 different negroes.

It is known that there are four different types of human blood which are usually designated as types I, II, III, and IV, they explained. The type of blood of any individual is largely determined by heredity and since the distribution of these types exhibited by the African negro and the white race is very different, it is possible to determine whether the blood of the American negro is approaching that of the Caucasian race.

The African negro shows a relatively small percentage in group II and a high percentage in group III compared to that of the white man. In both of these groups the distribution of American negro blood shows an approach to the distribution of the white race.

SCOTCH RAISE FOXES

Scots realize that the ladies will have their furs and that the trappers can not keep up with the demand. Silver fox raising which was started in Ross-shire two years ago has proved a success and the new industry will be extended. The Highlanders may seem personally partial to bare knees, but their well known racial thrift convinces them that the fashion for furs should be catered to. The Scottish Board of Agriculture is encouraging the fox breeding.

Louis Agassiz, the world famous zoologist and professor in Harvard, was a champion fencer.

There are enough motor vehicles in the United States to take the entire population for a ride at one time.

The largest telescope in the world, the 100-inch reflector at Mount Wilson Observatory in California, collects 160,000 times the light received by the eye.

A medical school was founded in Athens by Democedes in 522 B.C.

OYSTER CHANGES SEX THREE TIMES A YEAR

The remarkable and long disputed changes in the sex of the edible oyster are settled by researches of Dr. J. H. Orton of the British Marine Biological Association at Plymouth and Dr. R. Sparck of the Danish Biological Station at Limfjord. Working independently, both these naturalists announced that these bivalves may be male, then female, then male again all within one year. The rate of change, Dr. Sparck believes, depends largely upon the temperature of the water.

The oyster either never has possessed, or more probably has discarded all the trappings of sex. There is a single genital gland and a single duct. At one time male cells are produced and discharged into the sea-water in clouds. At another time egg cells are produced and are fertilized by male cells drawn in from the surrounding water.

There is no difference in the external appearance of the oyster in its male and female phases, although if the shells be opened, microscopical examination of the sexual gland shows the difference between mobile sperm cells and the large inactive egg cells. When it is sexually mature for the first time the oyster is male. Next, after a varying period, it becomes a female, and very soon after the discharge of the embryos it again begins to liberate male cells. One oyster has been known to change three times in a single season.

Dr. Sparck, however, thinks that the duration of the male stage depends on the temperature. The colder it is the longer the male stage lasts. The oysters in Southern Europe have been found to begin breeding at an earlier age than those of northern Europe. Oysters in the northern waters can produce young only every third or fourth year. And therefore only three or four times in their whole life.

WHY ARSENIC EATERS DO NOT DIE

Arsenic eaters never acquire a "tolerance" for this poison as was formerly supposed, according to Dr. Erich W. Schwartze, pharmacologist in the Bureau of Chemistry of the U. S. Department of Agriculture. He attributes the capability of these people to take large doses of arsenic compounds without harmful effects to the fact that the insolubility of these substances prevents absorption and hence they are harmless to the body.

Arsenic eaters have long been known to sprinkle their food with powdered arsenic or crunch lumps of it between their teeth, he said. The general concensus of opinion has been that they are able to take large quantities of this poison by virtue of the fact that they have become habituated to its use.

Dr. Schwartze has shown that arsenious oxide, one of the substances often eaten, is eight to ten times more toxic when taken in a dissolved form than when eaten as a coarse solid although pulverizing increases somewhat its toxicity. He suggests that the slight toxicity of arsenic compounds generally eaten is probably due to their difficult solubility as lumps of it have been known to remain undissolved in the stomach for long periods.

READING REFERENCE- Headden, William Parker. The occurrence of arsenic in soils, plants, fruits and animals. Denver, Colorado Scientific Society, 1910.
Lynch, G. R. Estimation of arsenic with special reference to its determination in tissue. Laccet 2:629-30. Sept. 16, 1922.

TABLOID BOOK REVIEWS

SPACE - TIME - MATTER. By Hermann Weyl. Translated from the German by Henry L. Brose. New York. E. P. Dutton and Co. $7.50.

Einstein considers Weyl the most competent interpreter of his theory of relativity and this translation gives the mathematical reader the best opportunity to become acquainted with this revolutionary conception of the universe.

AN HISTORICAL SURVEY OF VESTIBULAR EQUILIBRATION. By Coleman R. Griffith, assistant professor of Psychology, University of Illinois. University of Illinois weekly bulletin Vol. XX, No. 5. Urbana, University of Illinois, 1922. $1.50.

A valuable technical reference book with a splendid bibliography of the American, German, French, and English works on the problems of equilibration up to and including the year 1920. The author attempts to give a complete and scientific sketch of the work done from the time of Flourens in 1825 up to the present in research as to the part played by the internal ear in equilibration. The latest clinical methods and results are discussed briefly and errors in practice revealed by recent experiment pointed out.

BRITISH RADIO AMATEURS WORK WITH AMERICANS

British radio enthusiasts are cooperating with the American Radio Relay League in making the trans-Atlantic amateur tests this month successful.

The British Wireless Relay League, fostered by officers of the Wireless Society of Manchester, has recently been created and received the authority of the Postmaster General for its existence. The American Radio Relay League will cooperate with such aid and experience as it may be able to furnish the British organization, and another League similar to the American organization may be sucessfully established on a firm footing in the British Isles. There is no connection between the two at the present time and it is anticipated that there will be none other than a close cooperation and friendly interchange of ideas or activities.

The Wireless Society of London together with the society of Manchester, England, are putting up a powerful amateur station on the outskirts of Manchester for the purpose of entering the trans-Atlantic tests. They expect to bridge the gap. The new station's call is 2KW.

Study of the diseases of alcoholic beverages by Pasteur, the great French bacteriologist, prepared the way for study of germ diseases in animals and man.

The elephants which Hannibal brought from Carthage in Africa for use in fighting Rome are believed by naturalists to have been Indian elephants because of the viciousness and low intelligence of the African species.

Three new varieties of red raspberries have been developed at the New York Agricultural Experiment Station at Geneva.
